Knowledge in Science and Technology Parks

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INTRODUCTION

Science and technology parks (STPs) are considered as a kind of public-private partnerships designed to increase regional wealth and to foster technology start-ups growth in developed and/or in developing regions (Martínez-Cañas et al., 2011). The main aim of these institutions is to reproduce the successful factors of regional phenomena such as Silicon Valley or Boston's Route 128 (Mian et al., 2016). These institutions are focused on fostering knowledge ñows, mainly among tenant institutions, as well as between tenants and nearby external institutions. Although there is no ofðcial deðnition of STPs, some common denominators across different existing models suggest a set of minimum standards and requirements that any knowledge cluster should have to earn this formal recognition (Link, 2009). According to the International Association of Science Parks (IASP, 2002), a science park is "*a public or private organization managed by specialized professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions*".

Among the common denominators of STPs we can highlight the agglomeration and promotion of interactions among R&D centers, Labs, entrepreneurs, Universities, specialized human capital, innovation infrastructures, venture capitalists, research consortia, research projects, technological capital, and social capital (European Commission 2008). These factors are related and favor the capacity of any firm or institution to adapt constantly to technological, economic, and social changes in markets (Albahari et al., 2016). Therefore, STPs have emerged based on new institutional and artificial arrangements that facilitate interactive relations and knowledge exchange among three main groups of agents: Universities-R&D Centers, industry and government research agencies (Etzkowitz, 2008).

To enable these goals to be met, a Science Park aims to stimulate and manage the flow of knowledge and technology amongst universities, R&D institutions, companies, and agent's markets; it also facilitates the creation and growth of innovation-based companies through incubation and spin-off processes; and it even provides other value-added services together with high-quality space and facilities (Mian et al, 2016).

The main objective of this chapter is to shed some light in the role of STPs as specialized institutions leveraging knowledge creation and diffusion. First, the origin and evolution are analyzed. Second, the evolution and typology of models of STPs are showed. Finally, conclusions and future research directions will be proposed.

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BACKGROUND

STPs were originated in the United States as industrial concentrations that were quickly copied by other regions (Castells and Hall, 1994). The idea of concentrating companies in one single area became increasingly important in the mid-20th century, particularly during the World War II (Zhang, 2005). Shortly after that, most innovative companies were aware that science had made a vital contribution to victory (atomic energy, radar, aeronautical developments, etc.) and decided to develop an approximation to leading universities. This is how the first science parks came about around Stanford University and Menlo Park in California, both created towards 1950 (Hansson et al., 2005). In Europe, this phenomenon was retarded for almost twenty years. In the late 1960s, some universities in the UK, such as Cranfield and Cambridge, took action along these lines. In the first years, the growth and impact of parks were weak. Nevertheless, in the 1980s, the British government asked universities to be more collaborative with industry (Allen, 2007). This pressure led to the second wave of parks promoted by the main British universities. Growth continued during the 1990s and by then, more than half the universities already had some kind of agreement or collaboration with science parks. In France, the most significant example is Sofia-Antipolis, created around 1970. The first parks in Italy and Germany started in the early 1980s, concretely the Area Science Park in Trieste and the Technologic Park in Heidelberg, respectively. In Spain, the first park was not created until the second half of the 1980s. The first initiative was the Zamudio Technology Park (Bilbao), created in 1985. In summary, the creation of STPs throughout Europe and the United States has spread to other countries and continents and is currently considered a global phenomenon. Nowadays, there are hundreds of Science Parks and areas of innovation worldwide.

Studies and research on STPs are in an emerging stage of development, and during recent years researchers have stimulated an important academic debate concerning whether such property-based initiatives really enhance the performance of ðrms and economic growth of regions (Martinez-Cañas et al. 2011). To this respect, there are differences of results in previous empirical research with findings that show positive or no-signiðcant effects of STPs on the ðrms' performance (Link 2009). This divergence implies that previous studies do not analyze STPs from the point of view of their active role in the knowledge-based economy where intangible and relational aspects are critical in the market (Hansson 2007).

The research in STPs can be divided into two distinct, but complementary, aspects of STPs and areas of innovation: First, on the one hand, there is research concerning the effective role that STPs have as infrastructure. That is, they play an important role as a highly specialized institutions (with a mix of public-private policies, quality space, incubation facilities, spin-off mechanisms, the ability to accelerating the growth of small-medium firms and high value-added services) that are artificially created to help develop their environoment economically. On the other hand, they also play an important role through favoring a dynamic and innovative stimulation and management of the flow of knowledge and technology between universities and companies. That is, STPS facilitate the communication between companies, entrepreneurs, and technicians, providing environments that enhance a culture of innovation, creativity, and quality, for companies, research institutions and on people: the entrepreneurs and 'knowledge workers'. The prominence of this second aspect is being powered by the work of the IASP with a global network that gathers many thousands of innovative companies and research institutions across the globe, facilitating the internationalization of their resident companies.